

History of Agriculture of Galicia from the Second Half of 19th to First Third of 20th Centuries

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Abstract

From the second half of the 19th century until the beginning of the World War I, there was significant economic advancement in all sectors of farm management in the territory of Galicia (Halychyna), which was under the control of the Austro-Hungarian Empire during that period of history. This paper focuses on the impact of popular scientific extension, one of the key criteria for communicating the latest economic management techniques at that time. This allowed the region, which was significantly behind the other regions within the Austro-Hungarian Empire during that period, to progress economically. There was a breakthrough in methods and approaches to farm management during the studied period. The processes of mechanization, novel tillage techniques and land reclamation were introduced. Agricultural processing industry started to develop intensively. A serious consideration has been given to selective breeding of animals, which had a positive impact on the livestock rearing development. All these aspects have led to a significant improvement in the industry's performance.

Keywords

Galicia; Agriculture; Land reclamation; Farmland; Yield; Agricultural produce



Introduction

The third division of the Polish-Lithuanian Commonwealth (Rzecz Pospolita), in 1795, resulted in the annexation of the territories of west of Galicia to the Habsburg Monarchy – the lands up to Pilica (Pilitsa) and the Buh river in the north [the northern parts of the Cracow (Kraków) and Sandomierz provinces, the Lublin province, parts of the Holm land and Mazovia (Mazowsze)]. They were referred to as ‘new’, ‘late’, ‘younger’ or Western Galicia. In 1772, the Austrian government artificially consolidated the Ukrainian lands with parts of the Polish lands and formed the Kingdom of Galicia-Volhynia with the Grand Duchy of Kraków and the Principalities of Auschwitz and Zator as a new administrative unit of the Habsburg Monarchy (*in German*, Königreich Galizien und Lodomerien mit dem Großherzogtum Krakau und den Herzogtümern Auschwitz und Zator; *in Polish*, Królestwo Galicji i Lodomerii wraz z Wielkim Księstwem Krakowskim i Księstwem Oświęcimia i Zatoru). Lviv (Lemberg) was made the capital of the province, although the Austrian authorities initially considered Peremyshl (Przemyśl) or Jaroslav (Jarosław), closer to Vienna, as their options. By using the catchy name, the Austrian authorities were trying to underscore the so-called right of succession to the possession of the Ukrainian King Daniel dating back to the Kingdom of Galicia-Volhynia. The total area of the annexed lands was 83,000 km² with a population of over 2,340,000. The newly formed Kingdom of Galicia-Volhynia was one of the most densely populated provinces, encompassing 30,299 square miles and consisting of 7,980,477 citizens before World War I, of whom 4,672,050 were the Poles (58.5%) and 3,298,092 were the Ukrainians (41.3%) respectively. In Eastern Galicia, the Ukrainian population accounted for 72%, making it a majority (Nahayewsky, 1993, p.21). The Kingdom of Galicia-Volhynia was referred to as Galicia for short. It consolidated the Ukrainian ethnic lands (historical Galicia) and the lands of Malopolska. Administrative positions were held by the Polish nobles, although the majority of the population was of the Ukrainians. In addition to them, there were numerous Jewish and Armenian communities in the Kingdom. Subsequently, the Ukrainian area came to be called Eastern Galicia with its centre in Lviv, while the Polish area was referred to as Western Galicia with its centre in Cracow (Boyko, 2017).

Galicia existed in the above said status until November 1918. From November 1918 onwards, Galicia was under the administration of the West Ukrainian People's Republic (WUPR). It comprised 49 counties of Galicia, with a population of about 4 million people spread over a large territory (about 40,000 km²). On 22 January 1919, WUPR merged with the Ukrainian People's Republic (UPR), becoming the ‘Western Region of the Ukrainian People's Republic’ (WRUPR). This territorial entity was dissolved on 18 July 1919 as a result of the Ukrainian-Polish war, and Galicia was divided between Poland, Romania and Czechoslovakia. On 14 March 1923, the ‘Western Region of the Ukrainian People's Republic’ was finally dissolved at a meeting of the Board of Ambassadors of the Entente States, whereas Eastern Galicia was granted autonomy within Poland. The political agreement between the USSR and Germany in September 1939 (Molotov-Ribbentrop Pact)¹ resulted in the annexation of Eastern Galicia, then part of Poland, to the Ukrainian Soviet Socialist Republic. In August 1991, Ukraine declared independence and seceded from the USSR. Today, Eastern Galicia is part of Ukraine (Klapchuk, 2012).

In the second half of the 19th century and before the outbreak of the World War I, there was a significant advancement in the agricultural industry in Galicia. One of the reasons for the relatively successful rise of the agricultural sector in Galicia was the development of sectoral research, the findings of which were implemented using better agricultural extension. Systemic research and scientific experiments had made it possible to carry out both arable farming and animal husbandry, advantageously. However, science without further implementation of its discoveries could not significantly affect the industry development in the region. Therefore, it is essential to examine and comprehend the scientific innovations put into practice, i.e., integration of scientific research findings into the agricultural sector of Galicia.

¹ <http://historyfoundation.ru/2019/05/31/pakt/>

The authors, in this paper, have identified each segment that had influenced the evolution of agricultural industry in general and definite structural units of the agrarian sphere in particular: arable farming (cereal and other crops), plant cultivation (horticultural activities) and animal husbandry (cattle breeding, horse breeding, swine breeding and sheep rearing, etc.).

Methodology

This analytical article is based on the results of a comprehensive study being carried out at the Faculty of History of the Vasyl Stefanyk Precarpathian National University, Ukraine. The overarching theme of the study was “The economic development of Galicia during the Austro-Hungarian Empire”. Galicia comprises two parts – Eastern Galicia (the present-day territory of Ukraine) and Western Galicia (the present-day territory of Poland). Being a backward province of the Empire, in economic terms, it gradually began to develop successfully. This positive advancement had an integral effect on all economic realms, including agriculture.

The study of Galicia’s agriculture was pursued in three countries: Ukraine, Poland and Austria. The panel of scholars visited archival facilities in Lviv, Kyiv, Cracow, Warsaw and Vienna, where they processed statistical data covering the period under study. Science-based methods were applied during the study, which made it possible to establish the facts of economic progress, in particular comparative analysis allowed to establish the dynamics of agricultural development in the different sub-disciplines of crop and livestock production. By means of a system analysis, it became possible to develop patterns that reveal the conditions for successful sustainable development of the province. This article analyzes how one of the key factors of successful agricultural development, namely scientific extension, became the driving force of change and transformation: novel approaches to farming were developed as well as new efficient methods of farming, tillage and cattle breeding were introduced. The population of the backward province responded positively to the changes, embracing them and introducing them into their day-to-day operations. Systematization has made it possible to describe the entire case study in a consistent manner on the plane of scientific inquiry.

The overwhelming majority of Galicia’s residents, which was then an autonomous part of the Austro-Hungarian Empire, was involved in the agricultural sector, earning livelihood by arable farming and/or animal husbandry. To frame the research goals of this study, it was crucial to understand how agriculture was interpreted in terms of sectoral scientific achievements in that historic period. Therefore, it made the main path of this study to analyze the impact of theoretical scientific advances on human practice in the agrarian sphere via agricultural extension.

After all, the development of agriculture, in particular the use of natural resources, is part of the overall framework for studying Galicia’s economic history. It will make possible to broaden the scope of the inquiry and to use the results in scientific research aiding further studies in the region within the context of the defined goals. However, a subsidiary objective of this study is to draw attention of a wide range of researchers, scholars and all concerned to the topic in question – history of the development of Galicia from the Austro-Hungarian period.

As this research included translation of literature from Polish to Ukrainian in order to understand the facts, all the translations, unless indicated otherwise, from Polish to Ukrainian or English, are done by the first author.

Review of Literature

The suggested topic is scantily studied in national academia. The subject is partially covered in the works by Klapchuk (1972), Kovalchak (1988), and Klapchuk (2015). The agricultural development was widely examined in Polish scientific information sources for both the periods under study (Rewieński, 1890; Walewski and Gieysztor, 1890; Bujak, 1908; Diamand, 1915; Dziewulski, 1918), and in the first half of the 20th century (Grochowski, 1925; Pruski, 1925; Grochowski, 1927; Przerembel, 1930). The register of

literature on issues relating to agriculture, covering a significant part of the bibliography of the period under inquiry, proved to be valuable for the study (Estreicher, 1959; Kosiek, 1962; Dybiec, 1998). In addition to scholarly publications, agricultural extension has been communicated in the dedicated journals and scientific serials such as *Rozprawy c.k. Galicyjskiego Towarzystwa Gosp.*, *Rolnik*, *Przegląd Weterynarski*, *Ogrodnictwo*, *Bartnik Postępowy*, *Głos Rolniczy*, *Przewodnik Kółek Rolniczych*, etc. It is worth noting that much of the published data in the said titles was translation of the works of the foreign academics and experts.

It is apparent from the analysis that the history of agriculture requires a meticulous and systematic examination, which will provide an opportunity to reconsider the impact of science-industry achievements on the economic development of then Galicia. Therefore, the agricultural system development in Galicia during the Austro-Hungarian period needed to be thoroughly studied.

Arable Farming and Plant Cultivation

Having comprehensively analyzed the statistical data on agricultural development in Galicia in the period under study, key findings were obtained, allowing to substantiate the focal points of this article. The status of agriculture development in Galicia at that time was definitely much poorer than the status of agricultural sector development of the individual (chiefly agrarian) European countries. In the late 19th and early 20th centuries, yields of the cereal grains in the majority of the European countries were twice as high as in Galicia (Table 1).

Table 1: Yields of staple crops in Galicia and Europe (quintals per hectare or q/ha)

<i>States, regions</i>	<i>Wheat</i>	<i>Rye</i>	<i>Barley</i>	<i>Oats</i>	<i>White potato</i>
Belgium	27.0	24.0	29.0	24.0	175.0
Germany	23.0	18.0	22.0	19.0	150.0
Ireland	23.0	19.0	24.0	23.0	107.0
The Netherlands	26.0	19.0	28.0	22.0	190.0
Austria	15.0	15.0	16.0	13.0	100.0
Sudetenland	17.0	15.0	17.0	18.0	110.0
Galicia	13.0	11.9	12.6	12.0	126.3

Source: Diamand (1915)

Table 1 suggests that there was only white potato farming in Galicia that was relatively competitive in the European agricultural commodities market; but yields of the cereal grains were only half of other European countries. This was also confirmed by Bujak (1917) in his study *Economic Development of Galicia (1772–1914)*. He examined the average yield of agricultural produce between 1903 and 1912, defining the scope of examination by the limits of the early 20th century (Table 2).

Table 2: Average yield of agricultural produce (q/ha) in 1903–1912

<i>States, regions</i>	<i>Wheat</i>	<i>Rye</i>	<i>White potato</i>	<i>Hay</i>
Galicia	11.5	10.6	113.4	30.9
Czech Republic	17.7	15.8	94.8	32.9
Germany	20.3	17.0	132.4	42.5
Poznań	20.4	16.6	143.2	38.0
Denmark	30.0	19.0	164.0	41.0

Source: Bujak (1917)

The trend of the yield changes in Galicia between 1872 and 1913 was positive and a constantly growing one (Table 3). The reason for the boost can be attributed to agricultural extension, which was constantly developing in the region. Scientific advances in the field of agriculture were of increasing interest among the parties in charge of farming operations.

Table 3: Cumulative yield index in Galicia (q/ha)

<i>Years</i>	<i>Wheat</i>	<i>Rye</i>	<i>Oats</i>	<i>Barley</i>	<i>White potato</i>
1872–1876	8.8	6.5	5.9	7.9	72.0
1880–1884	9.1	7.2	6.4	8.0	85.0
1884–1888	9.5	7.6	7.2	8.5	92.0
1894–1898	9.2	8.0	7.3	8.2	100.0
1901–1910	11.0	9.9	9.1	9.7	110.0
1909–1913	11.7	11.3	10.7	11.2	111.0

Source: Jezierski and Wyczański (2006)

As a consequence, the economic situation in Galicia improved significantly in the early 20th century. Bujak (1917) wrote about the issue² thuswise:

“In the last few years before the war, we have been on the right track, we have undertaken extensive work on the rational organization of our economic life, and we have started to make up for our backlog and shortcomings. From a passive society, exploited by strangers from afar, we have become an active society, which has taken itself to use the wealth of its country and to satisfy its needs. If we were given an opportunity to continue along this path with all the perseverance and consistency, the gap between us and our western neighbors would undoubtedly be rapidly shrinking.” (Bujak, 1917, pp.57–58)

Advancement in the cereal cultivation in Galicia took place on the cusp of the 19th and 20th centuries and was largely the result of increased inputs in the agriculture, research on enhancing yields of cereal grains and maintaining land resources efficiency. Results of this study reveal the manner in which the farmland had undergone changes in its composition, under which crops the arable land was used, and how it had positively influenced the yield improvement in Galicia of that period.

Table 4: Land resources structure during 1852–1902

<i>Farmland type</i>	<i>Area in ha</i>		
	<i>1852-1866</i>	<i>1889</i>	<i>1902</i>
Arable land	3,590,373	3,803,444	3,799,575
Grassland and vegetable gardens	922,802	986,082	984,205
Grazing	768,944	743,480	716,918
Woodland	2,113,766	2,023,724	2,020,212

Source: Pilat (1905)

The structure of land resources (Table 4) changed dynamically in favour of arable land, grassland and vegetable gardens due to reduction of grazing and woodland. This trend should have influenced the increase in agricultural production in the region. An additional point is that 13.3% of the arable land was lying fallow in Galicia in 1900 (Pilat, 1898). This contributed to improved soil fertility and more efficient farmland exploitation, as the land was resting in a loose and weed-free state, which facilitated the accumulation of sufficient moisture in it. Between 1874 and 1913 (Table 5), the area under cereal crops gradually decreased, and conversely, the area under industrial and fodder crops increased.

² *Weszliśmy w ostatnich latach przed wojną na dobrą drogę, podjęliśmy rozległe prace około racjonalnej organizacji naszego życia gospodarczego, zaczęliśmy odrabiać zaległości i zaniedbania nasze. Ze społeczeństwa biernego, eksploatowanego przez obcych z daleka, stawaliśmy się społeczeństwem czynnym, które samo wzięło się do użytkowania bogactw swego kraju i do zaspokajania swoich potrzeb. Gdyby nam było danym iść dalej tą drogą z całą wytrwałością i konsekwencją, to niewątpliwie szybko zmniejszałaby się przestrzeń między nami a naszymi zachodnimi sąsiadami.*

Table 5: Arable land distribution in Galicia (in percentage)

<i>Years</i>	<i>Cereals</i>	<i>Legumes</i>	<i>White potato</i>	<i>Fodder</i>	<i>Alfalfa</i>	<i>Total</i>
1874	74.6	3.7	10.0	6.3	5.4	100
1881	71.2	4.3	11.3	7.2	6.0	100
1897	67.4	4.9	13.5	11.6	2.6	100
1913	67.7	2.5	14.8	12.2	2.8	100

Source: Jezierski and Wyczański (2006)

Decrease in cultivation of the cereal crops from 74.6% of all arable land of Galicia to 67% in the year 1913, a year before the World War I outbreak, could have had a negative impact on meeting the demands of the native population for food. Table 6 summarizes the dynamic pattern in the farmland structure in Galicia from 1900 till 1911.

Table 6: Dynamic pattern in the farmland structure in Galicia

<i>Farmland</i>	<i>Area in ha</i>			
	<i>1900</i>	<i>% of all used areas</i>	<i>1911</i>	<i>% of all used areas</i>
Arable land	3,799,879	48.41	3,806,619	48.50
Grassland	875,045	11.15	873,615	11.10
Grazing	716,848	9.13	738,604	9.41
Woodland	2,021,230	25.75	2,015,528	25.70

Source: Pilat (1900); Kryukov (1915)

At that time, most of the farmers were employing obsolete cultivation methods coupled with inadequate tools. Thus, in order to alter the situation and raise yields, it was essential to provide extension education to agricultural producers. It consisted of encouraging the use of modern equipment and the application of advanced management methods in farming systems. Jan Feliks Sikorski, in his seminal work *Mechanical Soil Tillage*, made an in-depth analysis of advantageous methods of tilling (Sikorski, 1898). The introduction of mechanization in all agricultural activities had greatly changed labour-intensive processes and, thus, had a positive impact on the efficiency of labour outcomes.

Table 7: Farming machinery and equipment in 1902

<i>Size of farms (ha)</i>	<i>Machinery (pcs)</i>	<i>Number of farms possessing machinery and equipment</i>									
		<i>Fertilizer drills</i>	<i>Grain drills</i>	<i>Forage harvesters</i>	<i>Reapers</i>	<i>Potato harvesters</i>	<i>Chaffcutters</i>	<i>Centrifuges</i>	<i>Shot casting plants</i>	<i>Milk houses</i>	<i>Flour mills</i>
<2	35,533	1	3	0	10	12	32,163	10	2,829	139	1,544
2-5	114,009	2	16	2	24	60	108,000	23	3,865	582	11,069
5-10	82,164	0	15	1	24	50	77,556	38	2,609	1,586	16,243
10-20	24,821	1	15	2	9	35	23,158	28	1,054	2,632	9,309
20-100	6,594	6	137	74	30	45	6,209	28	406	2,774	3,758
>100	3,801	276	2,138	1,211	606	406	3,598	213	859	3,300	3,069
Total	266,922	286	2,324	1,290	703	608	250,684	340	11,622	11,013	44,992

Source: Bujak (1908)

The maximum number of machinery and equipment was assigned to large farms that made handsome profits from their operations, whilst small family-operated farms possessed only the most necessary equipment. There were only three steam-driven ploughs and 12 mechanical drills in Galicia at that time (Bujak, 1908). The important constituents of yield improvement program were not only the mechanization processes, but also the research on soils, application of manures and fertilizers, introduction of crop rotation, as well as the new methods of land tilling, drainage of marshy fields, and use of melioration (Bujak, 1908; Biernacki, 1913). The drainage system along with irrigation of agricultural lands was given scientific credence (Krzyżanowski, 1879). It made it possible to exploit land plots that had previously been considered unfit for cereal crops cultivation. Commenced in 1876, active land improvement measures were enacted with the purpose of intensifying agriculture in the region. Certain areas of fecund soil were drained and irrigated, and the government significantly financed such interventions. Thus, during the 1876–1892 timeframe, the funds allocated to reclamation works increased 230-fold, amounting to PLN 1,607,370 (Pilat, 1898). Selection of cereal crops was another significant trend in the development of the sophisticated techniques in agriculture. The scientists worked on it in the Agrarian Academy in Dubliany (Mazurkiewicz, 1913), where experiments on different grain varieties were conducted in the field. The cultivation of wheat, barley, rye and oats was subject to in-depth analysis and research, especially to understand when to sow the crops and when to harvest.

White potato was used as a food item as well as the raw material for alcohol, starch and other derivatives' production. Significant areas of land were allotted to white potato cultivation as the yield was quite high in Eastern Galicia (Table 8). Farmers involved in white potato cultivation, and white beet farms were developed for the processing industry, namely alcohol manufacturing.

Table 8: White potato yields through 1909 to 1913

<i>Province</i>	<i>Area in thousand ha</i>	<i>Gross output in thousand quintals</i>	<i>Crop yield in q/ha</i>
Lviv	159,200	19,258.8	121
Stanislaviv	108,500	9,764.1	90
Ternopil	142,200	17,778.7	125
Galicia	409,900	46,801.6	112

Source: Khraplyvyi (1936)

Traditionally, small farms were not engaged in the cultivation of white beet, this was done by large and high-capacity farms. The relevant information on white beet growing (the results of tests, methods of planting and care, winter storage, and seed multiplication) was disclosed to the public (Żeleński, 1894; Turnau, 1903; Kosiński, 1906).

Table 9: White beet yields in Eastern Galicia during 1884–1906

<i>Crop plant</i>	<i>1884–1893</i>	<i>1896–1905</i>	<i>1906</i>	
	<i>Crop yield in q/ha</i>	<i>Crop yield in q/ha</i>	<i>Crop yield in q/ha</i>	<i>Gross output in thousand quintals</i>
White beet	165.1	205.4	212.0	1,107

Source: Bujak (1908)

Analysis of the results is presented in Table 9 that reveals that white beet yield increased rapidly, although most of the output was processed to produce alcohol rather than sugar (Dąbrowski, 1992). Researchers and scholars who were engaged in legume crop studies attributed a great significance to the clover cultivation. Most of academic papers highlighted soil tillage, the improved varieties, seed quality, nurturing, harvesting, drying and threshing (Czaykowski, 1902; Antoniewicz, 1905a; Wiśniewski, 1916). As the data in Table 10 shows, clover was planted to produce hay and seeds alike. Consequently, different seeding techniques, crop husbandry and post-harvest processing were employed. The demand for hay and seeds was obviously different and dependent on the exigencies. That is why the average annual area under clover cultivation for

hay was much larger than that for seed production.

Table 10: Clover crops and harvesting (1889–1898)

Clover	Area in ha			Crop yield in quintal	
	Total	% to farmland	% to arable land	Gross output	per ha
For hay	258,832	7.93	6.81	8,741,295	33.77
For seeds	15,339	5.93	0.4	23,853	1.56

Source: Pilat (1900)

Table 11: Areas and crop yields in 1899

Clover	Western Galicia			Eastern Galicia		
	Area in ha	%	Crop yield in q/ha	Area in ha	%	Crop yield in q/ha
For hay	141,256	48.4	43.5	150,670	51.6	30.9

Source: Klapchuk (2015)

The areas used under the cultivation of clover for hay increased from the annual average of 258,832 ha in 1889–1898 (see Table 10) to 291,926 ha in 1899 (see Table 11). There was also a noticeable difference in yields between Western Galicia and Eastern Galicia. The scholars who wrote on clover issues emphasized that clover was a perfect forage plant for animals, and its usage fertilized soil with nutritive substances (Zabłocki, 1902). Quite profound knowledge of clover was presented in Bronisław Janowski's work, who offered advanced methods of growing clover blends and thoroughly described the cultivation practices, harvesting and processing of the finished produce (Janowski, 1908).

Cultivation of flax for the fibres was prominently featured as an industrial crop (Jarosiński, 1916). Several fundamental works of that period contributed to the agricultural extension in Galicia. It is worth noting Władysław Noskowski's work, an agronomist and a teacher at the Agrarian School in Dubliany, where he turned attention of agricultural producers to the number of flax sub-varieties, their sowing features, how to raise them, how to use fertilizers, how to undertake measures against diseases and pests, and the latest methods of harvesting (Noskowski, 1872). Wojciech Chłopiński's *Cultivation and Processing of Flax* (Chłopiński, 1907) was commissioned by the Galicia Economic Society in Lviv, and it accelerated profound interest of the farmers in flax cultivation. Wojciech Chłopiński studied flax farming systematically and put high emphasis on this branch of farming systems. Additionally, he had other significant and popular publications relating to flax (Chłopiński, 1913; Chłopiński, 1917).

Table 12: Flax crops and harvesting during the period of 1889-1898

Crop plant	Area in ha			Crop yield in q	
	Total	% to farmland	% to arable land	Gross output	per ha
Flax	25,280	0.78	0.67	83,798	3.31

Source: Pilat (1900)

Table 13: Areas and crop yields in 1899

Crop plant	Western Galicia			Eastern Galicia		
	Area in ha	%	Crop yield in q/ha	Area in ha	%	Crop yield in q/ha
Flax	11,542	48.8	3.2	12,088	51.2	3.7

Source: Klapchuk (2015)

While comparing the data in Table 12 and Table 13, it is noticed that the areas used for flax cultivation in 1899 decreased as compared to the annual average for 1889–1898. However, more consideration was given to flax cultivation in Eastern Galicia than in Western Galicia; the yield in Eastern Galicia was higher.

During the study period, horticulture was observed enhancing in the region. It was further developed and improved by researchers, scholars, scientists and extension workers (Table 14). The published works contained detailed instructions on how to plant gardens, to nurture them in order to have sufficient yield, and to select the varieties; a large number of such studies were published both in Western Galicia (Giżycki, 1845; Konkolewski, 1847; Kozubowski, 1868; Czepiński and Langie, 1868–1869; Mieroszowska, 1890; Brzeziński, 1897) and in Eastern Galicia (Giżycki, 1845; Kisielewski, 1869, Schmidt, 1878; Boberski, 1880; Roehring, 1881; Pjerożyński, 1882; Ćwikliński, 1882; Oleskow, 1885).

Table 14: Fruit tree species in Galicia

Region	Proportion of fruit tree species in percentage								
	Apple trees	Pear trees	Plum trees	Cherry trees	Sweet cherry trees	Apricot trees	Peach trees	Mulberry trees	Nut trees
Galicia	58.4	11.1	17.0	7.1	4.3	2.2	0.1	0.1	3.3

Source: Klapchuk (2015)

In publications related to horticultural development, necessity of organizing fruit trade by establishing agencies for purchase and distribution of the horticultural produce was highlighted (Gniewosz, 1908). The total area under gardening in Galicia was reported 71,100 ha in the year 1936. More than 6.1 million plants or 129 plants per ha of fruit trees were planted in Galicia at that time (Table 15).

Table 15: Gardens in Galicia

Region	Number of trees	Number of trees per ha	Fruit harvesting	
			quintal	kg per capita
Galicia	6,122,123	129	1,300,129	26.4

Source: Khraplyvyi (1936)

Compared to the publications on the cultivation of horticultural crops, the number of published materials on fruit bush growing was much less. The reason was that this type of horticulture was underdeveloped in the region; some attention in the educational books was given to currant bushes. It was argued that this type of horticulture needed more attention of local farmers, as its produce is delicious and healthy (Tabeau, 1901; Morawski, 1902a, 1902b). Popular science journals also featured articles on the cultivation and crop husbandry of gooseberry bushes (Trzebiński, 1904; Namysłowski, 1907; Chmielewski, 1912; Namysłowski, 1913), raspberry bushes (Tabeau, 1901), and viticulture (Kośnierski, 1881; Brzeziński, 1904; Zajac, 1911), occasionally.

Hayfields and grazing were an essential source of natural fodder for livestock. There were 562,000 ha under hayfields in Galicia. Such fields were divided into low-lying (55.2%), fieldgrowing (42.7%) and reclaimed (2.1%) lands. Crop productivity level of hayfields was high in Galicia (Table 16). Low-lying hayfields yielded 58.5% of all hay, which was put in storage in Galicia, fieldgrowing was 36.5%, and reclaimed lands yielded 5% only.

The farms of Galicia occupied 211,284 ha of agricultural land for grazing (Khraplyvyi, 1936). The highest value was assigned to mountain pasture grounds, which existed in unpopulated mountain highlands. The similar processes were also exhibited in the works of researchers and scholars who, in due course, analyzed in the historical aspects the processes that took place before the World War I (Styś, 1936; Wykrętowicz, 1968; Michalewicz, 1993; Spyra, 1994; Kramarz, 2002; Kargol, 2010; Wnęk, 2010; Broński, 2012).

Table 16: Hay harvesting (thousand quintals)

Region	Low-lying			Field growing			Reclaimed			Total
	First cut	Second cut aftermath	Total	First cut	Second cut aftermath	Total	First cut	Second cut aftermath	Total	
Galicia	4594.6	1373.1	5967.7	3049.2	683.4	3732.6	370.1	134.7	504.8	10,206

Source: Klapchuk (2015)

Reinforcing the same processes in terms of the current study, Franciszek Bujak's quotation³ is pertinent here:

“Modern farmers set up distilleries and grow potatoes instead of grain, which they sell in the form of spirits and possibly ready-to-use vodkas; they set up sugar mills to grow beets; they set up breweries to bring in better out on barley; they process the wheat into flour and bran in their own mills and make bread in their own bakeries; they keep the gardens from which fruit and vegetables are processed into tinned food and other preserves.” (Bujak, 1917, p. 289)

Livestock Husbandry

Animal husbandry was regarded as an important branch of agriculture. Similarly, to plant cultivation, it required new and effective approaches in farm management practices. The sectoral research headed into this direction. The research was able to educate the consumers and shared the results of research by means of scholarly literature and educational books. The published papers during the study period tried to cover all major specialities of animal husbandry: horse breeding (Sanguszko, 1839; Rozwadowski, 1866; Kretowicz, 1884; Szybalski, 1887; Ryx, 1888; Zygmuntowicz, 1901; Dąbrowski, 1903), cattle breeding (Puchalski, 1871; Skrzyński, 1883; Dzianott, 1886; Malsburg, 1894), poultry farming (Bojanowski, 1901a, 1901b, 1901c; Bętkowska, 1903; Czaykowski, 1903; Mańkowski, 1905; Neumanówna, 1913), pig breeding (Czaykowski, 1901; Antoniewicz, 1905b; Masior, 1913), sheep rearing (Pawlikowski, 1840; Wodzicki, 1853; Stanowski, 1884), apiculture (Lubieniecki, 1859; Macieszkiwicz, 1886) and veterinary medicine (Wierzejski, 1881; Szpilman, 1887; Kwieciński, 1887; Seifman, 1887; Prus, 1895). Full attention was given to breeding, which enabled a qualitative improvement of the livestock units. In the second half of the 19th century, there was a general tendency to increase livestock units in Galicia, excluding the bouts of blight or murrain (Klapchuk, 2015).

Table 17: Dynamic pattern of livestock units in Galicia

Year	Horses	Cattle	Mules, Donkeys	Sheep	Goats	Pigs	Beehives
1851	530,554	1,434,826	741	955,908	221,000	675,000	0
1857	612,222	2,325,650	2,081	810,831	41,803	683,567	0
1869	695,610	2,070,572	1,891	966,763	35,824	734,572	257,493
1880	735,262	2,242,861	1,011	609,253	13,225	674,302	295,686
1890	765,570	2,448,006	1,203	630,994	21,095	784,500	261,047
Austria, 1890	1,548,197	8,643,936	57,952	3,186,787	1,035,832	3,549,700	920,640
% Galicia, 1890	49.45	28.32	2.08	19.80	2.04	22.10	28.35

Source: Pilat (1900)

³ Rolnicy nowoczesni zakładają gorzelnie i zamiast zboża uprawiają ziemniaki, a te sprzedają w formie spirytusu, a ewentualnie gotowych do konsumpcji wódek; zakładają cukrownie, aby uprawiać buraki; zakładają browary, aby lepiej spienić jęczmień; pszenicę przerabiają na mąkę i otręby we własnych młynach, a nawet mąkę na chleb we własnych piekarniach; utrzymują ogrody, z których owoce i jarzyny przerabiają na konserwy i inne przetwory.

In general, during the period under study (see Table 17), a sharp fall in the livestock numbers of sheep, goats, pigs, mules and donkeys was observed, whereas the number of horses and cattle was constantly growing. Galicia was home to almost half of the horses, a third of cattle and beehives at that time. As of 1910, there were more than 5.5 million heads of major livestock in Galicia.

Table 18: Livestock numbers in Galicia from 1900 to 1910

<i>Livestock species</i>	<i>1900</i>	<i>1910</i>	<i>Increase (+) or Decrease (-)</i>
Horses	869,138	905,272	+4.2%
Cattle	2,718,545	2,505,079	-8.5%
Pigs	1,254,909	1,835,464	+46.2%
Sheep	437,697	358,953	-18.0%
Goats	17,952	19,164	+6.8%
Mules and donkeys	962	481	-50.0%

Source: Pilat (1911)

When examining the data in Table 18, one may well notice that the number of cattle, sheep, mules and donkeys decreased during the study period, which was caused by various diseases and murrain, whilst the same period saw an increase in the number of pigs, horses and goats. The primary animal that contributed to agricultural activities of the region was horse. This is evidenced by the relevant statistics in Table 19.

Table 19: Number of horse units in Galicia

<i>Years</i>	<i>Size in thousand animal units</i>	<i>Density in animal units / km²</i>	<i>Density in animal units / per 1000 capita</i>
1830	478	6.2	115
1870	696	8.9	128
1882	735	9.4	123
1900	865	11.0	119
1912	906	11.5	113

Source: Jezierski and Wyczański (2006)

The horse population data discloses that their population size steadily increased for 80 years. This population increase of horses facilitated the development of agriculture in the region. Antoni Barański was a great authority in this field of agricultural research. In his studies (Barański, 1883; Barański, 1890), he described equine species with maintenance of their health, nutrition, husbandry, breeding and proper housing. He proved that oats were the best feedstuff for horses. As part of his scientific work, he studied domestic cattle breeds, colour inheritance in cattle, inherited diseases in horses, history of veterinary medicine, animal care, livestock breeding and veterinary legislation (Millak, 1957).

Another significant livestock were the cattle. In Galicia, as in other regions of the Empire, cattle belonged to the category of animals frequently bred in local farms. Most of the farmers were convinced that a cattle breeding was far more profitable than arable farming, and its added benefit was the large quantity of manure being produced. Accordingly, at the beginning of 1911, there were 2,505,012 cattle units in Galicia (Kryukov, 1915), including 1,491,548 cows (63.5%), 58,686 pedigree bulls (2.3%), 54,324 bulls for slaughter (2.2%), and 800,545 calves of both sexes (32.0%). Table 20 displays the cattle population and density during the 1830–1912 timeframe.

Analysis reveals that the cattle population declined by 8.5% in Galicia during 1900–1911. In the late 19th and early 20th centuries, the science-education literature informed much on livestock grazing, husbandry and animal care (Pająk, 1870; Popiel, 1882; Adametz, 1898; Turnau, 1901; Antoniewicz, 1902; Górniak, 1903). The knowledge of operating the farms where cattle were raised was constantly changing and increasing, having a positive impact on livestock farming development. Different works were published on

fodder preparations and methods of cattle feeding (Ludkiewicz, 1910), on calf rearing (Sandoz, 1913), on cattle feeding habit with green forage (Włodek, 1913), on sheep, pigs, and cattle breeding (Klecki, 1916). The local population of Galicia consumed only 50% of meat produced during the study period (Klapchuk, 2015). Meat product surplus was supplied to other regions of the Empire or exported abroad.

Table 20: Cattle population in Galicia

<i>Years</i>	<i>Size in thousand animal units</i>	<i>Density in animal units / km²</i>	<i>Density in animal units per 1000 capita</i>
1830	1,468	19.0	358
1870	2,072	26.8	380
1882	2,243	29.0	376
1900	2,715	35.1	371
1912	2,503	32.4	312

Source: Jezierski and Wyczański (2006)

Another important element of animal husbandry in Galicia during the study period was sheep rearing, which required due attention, as their population was constantly declining. In 1880, there were 609,000 sheep in Galicia, and before 1910 the number of sheep decreased by almost twice (i.e., –359,000). The importance of sheep rearing can be confirmed by the fact that 61,365 rural and urban farms were engaged in sheep rearing in Galicia comprising 12.9% of all farms. Thus, there were 3.8 sheep per Galician farm at that time (Klapchuk, 2015). The largest sheep stock, about 50% of the total number in Galicia, was in the Stanislaviv province.

Table 21: Sheep stock in Galicia

<i>Years</i>	<i>Size in thousand animal units</i>	<i>Density in animal units / km²</i>	<i>Density in animal units per 1000 capita</i>
1830	751	10	181
1843	1,367	18	207
1869	967	12	178
1890	631	8	95
1910	378	5	47

Source: Jezierski and Wyczański (2006)

This was due to the existence of large areas of high-altitude mountain pastures (over 18 thousand ha), which made sheep grazing possible with minimal costs for their upkeep.

Table 22: Sheep stock in Galicia in 1910

<i>Province</i>	<i>Size in animal units</i>
Lviv	70,573
Stanislaviv	148,662
Ternopil	89,903
Galicia	309,138

Source: Klapchuk (2015)

The authors of research studying sheep rearing advocated for the breeding of these animals. The published material contained the guidelines advising how to raise lambs and mature sheep, how to arrange their feed and housing (Pawlikowski, 1840; Wodzicki, 1853; Stanowski, 1884; Łaszczyński, 1891). However, the number of these research papers was insufficient in comparison to the studies on horses or cattle. There were also not enough papers on pig farming. Despite this, pig farming was vibrant in Galicia. In 1900, there were 1,294 pig units, and their number increased to 1,835 units in 1910 within the region (Kryukov, 1915).

Table 23: Dynamic pattern of pig population in Galicia

<i>Years</i>	<i>Size in thousand animal units</i>	<i>Density in animal units / km²</i>	<i>Density in animal units per 1000 capita</i>
1870	735	9.4	135
1890	785	10.0	119
1900	1,254	16.0	169
1912	1,834	23.4	229

Source: Jezierski and Wyczański (2006)

Over the period of 1870–1912, the pig number increased by a factor of 2.5 (Table 23), while the number of animal unit per capita increased by a factor of 1.7 only. This was affected by the various pig diseases during the study period. Resultantly, 100,000 pigs were compulsorily slaughtered due to epizooty⁴ between 1899 and 1906. For these reasons, important academic papers came into light on effective pig feeding, breeding, prevention of diseases, propagation, piglets raising, husbandry (Czaykowski, 1901; Antoniewicz, 1905b; Masior, 1913).

Another vital component of animal husbandry was poultry farming. During the period of study, a significant rise in the fowl population took place (Table 24). The number of hens had almost doubled, while the number of other domestic fowls increased by 2.5 times. Poultry farming in Galicia was developed mainly in small peasant farms. Poultry products worth 31.8 million kronen⁵ were exported from Galicia annually (Kryukov, 1915).

Table 24: Number of poultry in Galicia (1900–1910)

<i>Poultry species</i>	<i>Number of units</i>		<i>Population increase</i>	
	<i>1900</i>	<i>1910</i>	<i>Units</i>	<i>Percentage</i>
Hens	6,878,377	10,301,255	3,422,878	49.8
Geese	457,939	566,671	108,732	23.7
Ducks	285,319	384,533	99,214	34.8
Other fowl	133,252	234,271	101,019	75.8
Total	7,756,787	11,488,640	3,731,843	48.1

Source: Pilat (1911)

Evidently, with the increasing demand of animal proteins in Galicia region, researchers on animal husbandry advocated the necessity to develop poultry farming. The research articles on this topic rose in number at the turn of the 19th and 20th centuries (Bojanowski, 1901a, 1901b, 1901c; Stasieniewiczowa, 1902; Mańkowski, 1905; Kukura, 1906; Misiewicz, 1912a). The publications recommended the development of domestic fowl breeding on small farms. In their works, both the academicians and practitioners of poultry farming had proved that this type of management was as essential as horse and cattle breeding (Misiewicz, 1912b). They had also considered for geese farming and fattening, and proper handling of their feathers (Bętkowska, 1903).

Findings and Conclusion

One of the primary objectives of this study was to put Galicia in the public eye. This subject was poorly studied previously in Ukraine, as it was covered mainly in Poland and countries belonging to erstwhile Austro-Hungarian Empire. Thus, the development of agricultural knowledge in Galicia is witnessed by a large number of relevant publications. It should be noted that an awareness was fostered about the need to overhaul obsolete and inefficient farming practices with the help of scientific inputs.

⁴ An epizootic disease affecting many animals at the same time, or an epidemic amongst animals.

⁵ A former Austrian monetary unit.

Based on the above analysis, it is argued that a significant number of scholars, researchers, and reformers, who were engaged in regional development of farming practices, believed that agriculture would have been more successfully developed than the manufacturing industry in the Galician region (Wnęk, 2015). The results of the major crop growth yields during the interval between 1901–1911 are summarized in Table 25.

Table 25: Gross output of staple crops

1901-1910		1911	
Gross output in quintal	Crop yield in q/ha	Gross output in q	Crop yield in q/ha
Rye			
6,180,353	9.8	8,312,636	11.9
Barley			
3,331,236	9.6	4,295,597	12.6
Oats			
6,195,941	9.5	8,428,168	12.0
Maize			
910,245	11.4	719,291	11.5

Source: Kryukov (1915)

This was made possible by communicating and adopting both the latest techniques in agriculture and new methods of work organization in the industry. The problems that did not allow gaining high yields were revealed. The scientific approach to soil structure and nutrition, and introduction of effective mechanization, fertilizer or manure application, land reclamation, etc. was developed. A clear-cut breakthrough in crop cultivation was the development of the new crop varieties, which enabled a significant yield enhancement. An unequivocal achievement during the study period was the development of animal husbandry in Galicia. Such fundamental developments in agricultural productivity are attributed to the contributions made by scientific and academic research and extension.

Table 26: Livestock density in the top ten European livestock breeding countries

Country, land	Livestock density per km ²				Density per 100 inhabitants			
	Horses	Cattle	Pigs	Sheep	Horses	Cattle	Pigs	Sheep
Austria	6.0	30.5	21.4	8.2	6.3	32.0	22.5	8.5
England	6.9	37.5	11.3	99.4	5.2	28.2	8.5	74.9
Belgium	8.5	63.0	37.9	8.0	3.8	27.7	16.6	3.5
Galicia	11.5	31.9	23.3	4.5	11.2	31.2	22.8	4.4
Denmark	13.7	57.5	37.6	18.6	20.6	86.6	56.6	28.0
Spain	1.0	4.7	4.8	29.9	2.6	12.1	12.4	77.5
Italy	3.3	21.6	8.7	38.9	2.9	19.0	7.7	34.3
Germany	8.0	38.1	41.0	14.2	6.6	31.7	34.1	11.8
France	6.0	26.6	13.6	32.3	8.2	36.4	18.6	44.2
Sweden	1.3	6.0	2.0	2.2	11.3	53.1	17.9	19.8

Source: Pilat (1911)

In terms of livestock density per km² and per 100 inhabitants, as is evident from Table 26, Galicia ranked among the top six countries in Europe during the study period. Another important accomplishment of agricultural extension was that the correct perspectives of agricultural science gradually instilled in agricultural readers while changing their beliefs that profound change in agronomic practices and economic comprehension of farming practices would significantly improve their economic situation and increase the productivity of farmworkers. The literature underscored that the work of farmers was a unique and demanding occupation, which was aimed at obtaining high agricultural productivity – a source of income for people not only in Galicia but also throughout Europe.

Considering the discussion above, it is witnessed that a substantial advancement in the development of agriculture was registered in Galicia during the Austro-Hungarian era. All this would have been impossible without the meticulous work of agricultural scientists, who relentlessly and doggedly promoted innovative concepts of working on land. The data that has been discussed and analyzed in this paper will be further developed into doctoral research aimed at unveiling the features of the natural resources development and use across the economic history of Galicia Kingdom. This will enable this innovative topic to be addressed not only on the domestic plane but will also help broader section of academics and specialists interested in the subject to start up their concepts and perspectives.

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Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	Author 1	Author 2	Author 3	Author 4
Conceived and designed the research or analysis	Yes	Yes	Yes	Yes
Collected the data	Yes	Yes	Yes	Yes
Contributed to data analysis & interpretation	Yes	Yes	Yes	Yes
Wrote the article/paper	Yes	Yes	Yes	Yes
Critical revision of the article/paper	Yes	Yes	Yes	Yes
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